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NA-22 Write for Consortium Efforts  
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### Project 1: Measurement of legacy items with Radiochemistry for Pu and Np

We are asked to look into the improvements for the measurement of Pu of a variety of material types (MT): MT41 (Pu-242, 20 – 60% enriched), MT42 (Pu-242 > 60% enrichment), and MT-82 (Np-237). Many of these are legacy items that were packaged years ago (Fig 1&2), and when the items are re-packaged for long-term storage, they must be re-measured using either NDA (non-destructive analysis methods or radiochemical methods. It is of interest to improve the NDA and radiochemistry to reduce the un-certainty in the measurements, as in the case of larger items (250 g to 2 kg items) the uncertainty in measurements makes it difficult to certify the mass of the material down to the 0.5 g accountability requirement per DOE orders by only doing NDA measurement. It would be of interest to look into methods to improve the detection of these materials, which would not only benefit the weapon manufacturing community, but also has the ability to significantly improve the non-proliferation community.



*Figure 1: MT41 in legacy packaged (LA-UR-19-31327)*



*Figure 2: MT42 in legacy packaging (LA-UR-19-31327)*

## Project 2: Environmental Radiochemistry

Efforts have been made between AAC (Actinide Analytical Chemistry), XCP-7, and MST-16 to development predictive models that tie neutron transport codes into the radiochemistry efforts at LANL to improve the environmental models for weapons effects codes. In the past, efforts have been made to understand the chemistry of the actinides present in Nevada National Security Site soils, but this work seeks to expand this horizon by adding the predictive capability of new tools for predictions of the locations and the radio-nuclides produced in post-detonation environments. An example of this is given in Fig 3 where a un-structured mesh MCNP representation of Nd-147 is given after a height of burst from a 100 kT device is detonated in Atlanta, Ga. It would be of interest to continue to pursue this effort to further refine the chemistry and weapons effects tool-kits.

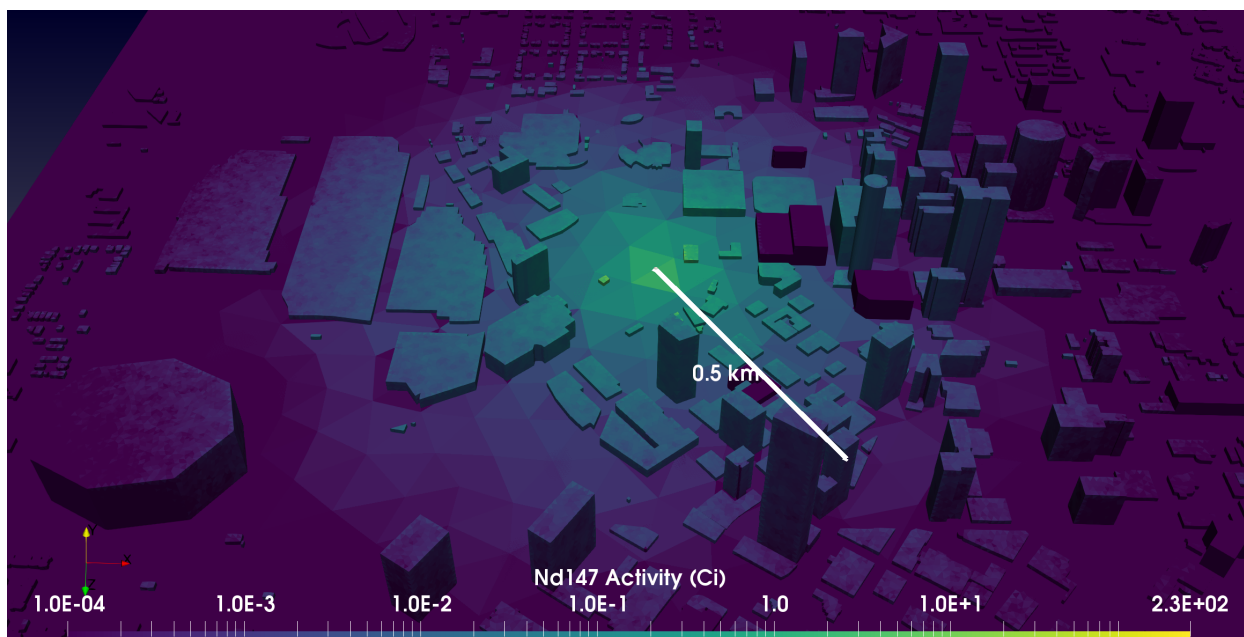


Figure 3: Nd-147 activity after time of detonation from a 100 kT detonation with a HOB of 6 ft in Atlanta, GA (LA-UR-20-214369).